

Catalogue of 81 Double Stars, discovered with a 6-inch Alvan Clark Refractor. By S. W. Burnham, Chicago, U.S.A.

It is believed that the stars enumerated in the accompanying list have been hitherto unknown as double stars, as they are not found noted in the numerous catalogues and publications relating to this subject. With a single exception they were discovered with a 6-inch Alvan Clark refractor, and but three or four of them have been seen by me with any other instrument. The position angles and distances are estimated, except in the few instances where measures have been made by George Knott, Esq., as stated in the "Notes." The magnitude of the primary is generally that given in the star-catalogue from which its place is taken, the secondary being rated according to Herschel's scale.

The more prominent works which have been examined are:—

Struve's *Mensuræ Micrometricæ*; Otto Struve's *Catalogue de 514 Etoiles Doubles et Multiples*, &c., 1843, and the revised edition of 1850; Herschel and South's *Catalogue of 380 Double and Triple Stars* ("Philosophical Transactions," 1824); South's *Catalogue of 458 Double and Triple Stars* ("Philosophical Transactions," 1826); Secchi's *Catalogo di 1321 Stelle Doppie*, &c. Herschel's *Results of Astronomical Observations at the Cape of Good Hope*; the seven series of Sir John Herschel in the *Memoirs of the Royal Astronomical Society*; *First Catalogue of 321 New Double and Triple Stars* (Vol. II.); *Second Catalogue of 295 New Double and Triple Stars* (Vol. III.); *Third Catalogue of 384 New Double and Triple Stars* (Vol. III.); *Fourth Catalogue of 1236 New Double and Triple Stars* (Vol. IV.); *Fifth Catalogue of 1304 New Double and Triple Stars* (Vol. VI.); *Sixth Catalogue of 286 New Double and Triple Stars* (Vol. IX.); *Seventh Catalogue of 84 New Double and Triple Stars* (Vol. XXXVIII.); the several Catalogues of Jacob, Dunlop, Wrottesley, Powell, Smyth, Fletcher, Dawes, and others, found in the *Memoirs of the Royal Astronomical Society*; and the discoveries of Dawes, Clark, Dembowski, Winnecke, Knott, Otto Struve, and others, in *Monthly Notices, Astronomische Nachrichten*, &c., embracing altogether nearly 8000 different double stars visible in this latitude.

No.	Designation.	R.A. 1870. h m s	Decl. 1870. ° ' "	Position est. ° ' "	Dis- tance est. "	Magnitudes.	Discovered.	Notes.
1	Arg. (+55°) 191 A and B	0 45 12	+55 55	90	1'5	7½, 11 {	Sept. 12, 1871, and	One of the finest multiple stars in the heavens. B and E very difficult, and at first overlooked. Numerous other stars in the field more distant.
	A and C	..	..	135	4	8½	Sept. 14, 1872	12 ^m 4 ^s <i>f</i> a <i>Cassiopeie</i> and 5' 43" north.
	A and D	..	..	200	10	10		
	A and E	..	..	360	15	15		
2	Weisse i. 16	1 3 12	+29 11	160	1'5	9, 10½	Sept. 26, 1872	1 ^m 16 ^s <i>p</i> τ * <i>Piscium</i> . and 13' 19" south.
3	Arg. (+55°) 278	1 9 3	+55 49	40	5	8, 11	Sept. 6, 1871	In <i>Cassiopeia</i> .
4	Weisse i. 236	1 16 2	+10 45	100	0'5	7, 7½	Oct. 24, 1872	Very close and difficult pair in <i>Pisces</i> . The brightest of two stars about 12' apart; the other <i>s p</i> .
5	103 <i>Piscium</i>	1 32 15	+15 58	300	1'5	7, 12	Nov. 3, 1872	Fine and not very difficult pair; in the same field <i>n p Piscium</i> , 6 mag.
6	L. 3205	1 38 13	- 7 25	190	3	7, 10	Nov. 17, 1871	In <i>Cetus</i> , <i>n f</i> Σ 150.
7	58 <i>Ceti</i> = B.A.C. 598	1 51 23	- 2 42	15	3'5	6½, 14	Nov. 11, 1871	A very delicate and difficult object, resembling 94 <i>Ceti</i> , but closer. "Piazzi says he could not find this star. It is probably variable."— <i>Note</i> to B.A.C.
8	Arg. (+8°) 364	2 14 27	+ 8 17	200	0'9	8, 10	Nov. 11, 1871	A close and moderately difficult pair, between ξ^1 and ξ^2 <i>Ceti</i> .
9	L. 5107 = Weisse ii. 921-2	2 39 4	+35 1	165	1'5	7, 9 {	Oct. 15, 1872	A fine double, 4 ^m 26 ^s <i>p</i> 17 <i>Persei</i> , and 29' north.
10	L. 5276 = Weisse ii. 738	2 43 51	- 5 31	100	3	7, 14 {	Jan. 8, 1872	A somewhat difficult pair, the <i>f</i> of three stars forming a triangle in the finder.
11	ϵ^2 <i>Eridani</i>	2 56 19	- 8 12	85	3	5½, 10	Nov. 11, 1871	The companion of this very beautiful pair seems to be variable. I have seen it well with the aperture contracted to 3 in.; at other times, in equally good weather apparently, it required careful attention with the full aperture.

* In MS. r.—Ed.

No.	Designation.	R.A. 1870. h m s	Decl. 1870. ° ' "	Position est.	Dis- tance est. "	Magnitudes.	Discovered.	Notes.
12	Weisse iii. 308	3 18 8	-14 27	270°	2.5	7, 10	Nov. 28, 1872	In <i>Eridanus</i> ; not difficult.
13	Weisse v. 678	5 28 6	-4 35	130°	1	8, 12	Nov. 11, 1871	This excessively difficult pair is in the same low power with Σ 743, 5'43" s, a little <i>p</i> , and is No. 381 of Bond's "Catalogue of Stars about the great Nebula of Orion."
14	L. 10696	5 34 10	+29 47	200	5	8, 11	Mar. 19, 1872	In <i>Auriga</i> , 30' n. f. Σ 764.
15	Weisse v. 1022	5 41 14	-2 21	190	2	8, 14	Feb. 2, 1872	Another very difficult pair in <i>Orion</i> , 8 ^m 2 ^s f. Σ <i>Orionis</i> , and 20' s.
16	3 Monocerotis	5 55 43	-10 36	356.1	1.79	5½, 10	Dec. 20, 1871	The measures of distance and position of this fine pair were made by George Knott, Esq.
17	4 Monocerotis	6 2 19	-11 7	178.6	3.38	6, 10½	Mar. 3, 1871	Measured by George Knott, Esq., who has detected a 11½ mag. companion at 244.1°; D=10".
18	L. 12006	6 10 39	-12 0	280	1.5	7½, 10	Dec. 27, 1871	A close but easy pair <i>p</i> Σ 3116. It is singular that Struve should have missed this and the two preceding objects in the same vicinity, as they are comparatively easy.
19	L. 12936	6 36 8	-15 53	169.4	4.07	7, 9½	Feb. 22, 1871	A very easy pair in <i>Canis Major</i> , <i>n</i> <i>Sirius</i> . Measured by George Knott, Esq.
20	L. 13170	6 42 58	-16 4	30	3	8, 12	Jan. 8, 1872	The middle of three stars nearly in a line, <i>n</i> f. <i>Sirius</i> . The companion is very faint and rather difficult.
21	" Canis Minoris	7 21 2	+7 12	30	5	6, 14	Feb. 2, 1872	The companion an exceedingly minute point of light.
22	Weisse vii. 689	7 24 51	+33 7	155	7	8½, 11½	Feb. 11, 1872	In <i>Gemini</i> , nearly 1° n. of <i>Castor</i> .
23	Anonyma	7 55 44	+3 26	180	3	8, 13	Feb. 2, 1872	A difficult double in <i>Canis Minoris</i> , <i>n</i> f. a 7-mag. star. There is a very faint pair in the <i>n</i> <i>p</i> quadrant, about 100" from the primary.
24	L. 17586	8 47 55	-8 16	170	1.25	7½, 9½	April 18, 1872	This close pair is about ¾ s. of 17 <i>Hydræ</i> (Σ 1295).

No.	Designation.	R.A. 1870. h m s	Decl. 1870. ° ' "	Position est.	Dis- tance est.	Magnitudes.	Discovered.	Notes.
25	Weisse x. 242	10 15 15	- 9 7	190	1.75	8, 10	April 8, 1872	In <i>Sextans</i> .
26	L. 21697	11 17 12	- 9 42	75	2	7, 10½	April 3, 1872	This very pretty pair is 30' from <i>Crateris</i> , <i>n. p.</i>
27	L. 23106	12 13 29	+ 14 35	110	4	7, 12	April 22, 1872	An interesting double star, about 1½° s. f. 6 <i>Comæ</i> . This star is Weisse xii. 197.
28	B.A.C. 4213	12 23 23	- 12 40	355	3	6½, 12	April 10, 1872	Very delicate and beautiful double star, preceding and nearly equidistant from <i>Corvi</i> , 45 B and 48 B. This star is P. xii. 104.
29	L. 23536	12 28 57	- 16 7	260	10	7, 13	May 3, 1872	A delicate object; in <i>Corvus</i> , 5 ^m 45 ^s f δ and 20' s.
30	Arg. (+ 20°) 2904	13 51 57	+ 20 5	220	5	8½, 14	May 24, 1872	In <i>Boötes</i> , 3 ^m 50 ^s p ≈ 1797.
31	L. 27106	14 46 31	+ 19 16	180	1	8, 10	May 4, 1872	This very beautiful and close pair is about 30' from <i>Boötis</i> , <i>s. f.</i> ; a difficult object. I have since been informed by Mr. Alvan Clark that he discovered this pair a year or two earlier, but the fact was never published.
32	6 Serpentis	15 14 25	+ 1 11	30	3	5½, 13	June 18, 1872	Splendid double star, but excessively difficult.
33	Weisse xv. 424 = L. 28246	15 24 5	- 12 33	45	3	8, 11	June 9, 1872	} Two double stars in the same field; the last 4' from the other, <i>s. f.</i> , in <i>Libra</i> .
34	Anonyma	..	..	55	3	10, 10	June 9, 1872	
35	B.A.C. 5184	15 35 27	- 15 36	90	2	7, 9	June 11, 1871	This very easy pair is <i>s. p. n. Librae</i> . It is identical with P. xv. 150.
36	2 Scorpii	15 45 48	- 24 56	270	3	5½, 10	June 20, 1871	An extremely beautiful object (= B.A.C. 5250).
37	Anonyma	15 54 39	- 24 13	40	2	9, 10	June 15, 1872	Faint but difficult pair, 24' <i>n. p.</i> a 7-mag. star (B.A.C. 5317).
38	L. 29136	15 55 3	- 24 39	350	4	7, 11	June 19, 1870	Some distance <i>n. f. π Scorpii</i> .
39	11 Scorpii	16 0 23	- 12 24	258.2	3.75	6, 12	June 23, 1872	Strangely missed heretofore. Measured by G. Knott, Esq.

No	Designation.	R.A. 1870. h m s	Decl. 1870. ° ' "	Position est.	Dis- tance est. "	Magnitudes.	Discovered.	Notes.
40	Arg. Z. 388, No. 32	16 3 51	-27 13	350	4	8, 10½	April 27, 1870	52' north of 12 <i>Scorpii</i> , a little <i>p</i> .
41	Arg. (+61°) 1583	16 17 16	+61 45	60	1'5	9, 11	June 9, 1871	A difficult pair, 5 ^m <i>p</i> <i>n</i> <i>Draconis</i> , and in the same low-power field with Σ 2045, <i>s p</i> .
42	Weisse xvi. 1076	16 34 56	+29 16	35	4	9, 10	May 21, 1872	Faint pair in <i>Hercules</i> .
43	Weisse xvi. 785	16 41 48	+2 58	70	1	8, 9	June 23, 1872	Close pair 40'n of and a little <i>p</i> 19 <i>Ophiuchi</i> (Σ 2096).
44	Arg. (+28°) 2697	17 9 11	+28 59	15	7	8½, 11	July 11, 1871	In <i>Hercules</i> , 3 ^m 40 ^s Σ 2147. A faint companion <i>n f</i> . $D=25''$.
45	Weisse xvii. 345	17 13 6	+32 37	290	5	9, 9½	May 3, 1870	A faint pair 2 ^m 40 ^s <i>p</i> 72 <i>Herculis</i> .
46	Weisse xvii. 296	17 17 39	+13 31	190	3	8, 14	June 15, 1872	Difficult; the <i>p</i> star of a small equilateral triangle, the <i>f</i> star of which is Σ 2159.
47	L. 32978	17 54 19	-10 14	270	1'25	8½, 11½	Aug. 15, 1871	An excessively difficult pair, about 45' <i>s f</i> <i>n</i> <i>Ophiuchi</i> .
48	L. 33729	18 13 19	-19 43	10	2'75	8 11	July 21, 1871	Two faint companions <i>p</i> .
49	Anonyma	18 16 28	-19 39	40	7	8, 11½	Aug. 2, 1871	About 1° <i>n</i> of 21 <i>Sagittarii</i> .
50	Arg. (+39°) 3475 A and B C B and C	18 33 38	+39 29	330	70	8½, 12	June 3, 1872	Excessively difficult double companion; 6 ^m 15 ^s <i>p</i> ϵ <i>Lyrae</i> , in the same field with a 6-mag. star (B.A.C. 6357), 4'7 exactly <i>s</i> .
51	Arg. (+39°) 3523 A and B C B and C	18 41 21	+39 32	190	90	8½	July 3, 1870	This star with a double companion is 1 ^m 20 ^s <i>f</i> ϵ 1 (4) <i>Lyrae</i> .
52	Weisse xviii. 1793 A and B B and C	18 58 7	+25 52	300	40	8, 11	Oct. 6, 1872	In the same field with Σ 2444, 23 ^s <i>p</i> . The third star exceedingly minute (=L 35688).
53	Arg. (+11°) 3902	19 29 19	+11 9	255	1'7	8¾, 11	Sept. 14, 1872	In <i>Aquila</i> ; strangely difficult for magnitudes and distance.

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54	Σ. 2557 A and C	19 34 25	+29 27	290	15	8, 14	Oct. 6, 1872	Weisse, xix. 1088. A minute companion overlooked by Struve.
55	*'s of γ Aquilæ	19 40 3	+10 15	40	3	10, 10	June 26, 1870	Very faint and difficult pair, about 3' s of γ Aquilæ; triple with a third star p.
56	Weisse xix. 443	19 58 15	-4 41	180	2	7½, 10	Aug. 21, 1871	Beautiful pair; the p one of three stars forming an equilateral triangle in the finder (= L 38343).
57	L. 38415	19 59 27	+15 8	140	2	7, 15	July 30, 1872	A beautiful, but excessively difficult double; 40' from 14 Sagittæ sf.
58	Weisse xix. 2025	20 1 23	+15 42	190	10	8, 13	July 30, 1872	3 ^m 50 ^s f 14 Sagittæ, and 1' 54" n.
59	Weisse xx. 213	20 10 7	+4 44	125	6	8, 11	Oct. 3, 1872	Not very difficult or interesting.
60	π Capricorni	20 19 52	-18 38	144.9	3.15	5, 10	Aug. 8, 1871	The distance and position of this elegant double star measured by George Knott, Esq.
61	ε Capricorni A and C	20 21 27	-18 14	135	30	5, 15	Aug. 8, 1871	An excessively difficult companion near the line joining ε and the 7½ mag. star sf.
62	L. 39445	20 22 42	+29 42	140	1.25	8, 10	Sept. 21, 1871	Close and difficult pair, 25' sp 41 Cygni; two distant companions at 180° and 270°.
63	1 Delphini	20 24 4	+10 28	340	0.7	6, 11	Oct. 4, 1872	One of the most difficult of double stars.
64	Weisse xx. 977	20 38 50	+12 15	350	0.8	9, 9½	Aug. 27, 1872	The north star of a wide equal pair about 90" apart. Discovered with Prof. Young's 9.4-in. refractor.
65	13 Delphini	20 41 22	+5 32	195	1.25	6, 10	Nov. 11, 1871	An elegant pair. The first of five double stars found to-night.
66	Arg. (+ 26°) 3995	20 42 33	+26 58	160	2	8, 8	Oct. 6, 1872	Fine pair in Vulpecula.
67	Weisse xx. 1460	20 45 12	+30 26	290	1.25	7, 11½	Sept. 21, 1871	A beautiful but difficult double, 4 ^m 55 ^s f 52 Cygni, and 1½° n. of O Σ 415. This is L. 40318.
68	Arg. (+ 49°) 3431	20 55 17	+49 43	170	1.5	8½, 9	Sept. 19, 1872	In Cygnus, 1 ^m 56 ^s f P. xx. 429 (Σ 2741) and 15'.4 south.

No.	Designation.	R.A. 1870. h m s	Decl. 1870. ° ' "	Position est. ° ' "	Dis- tance est. "	Magnitudes.	Discovered.	Notes.
69	Weisse xx. 1743-4	20 56 43	+21 7	350	2	8, 9	June 23, 1872	The γ star of a wide pair of 8 mag. stars. In <i>Vulpecula</i> .
70	L. 40824 A and B C	20 58 23	+11 31	235	70	8	Aug. 5, 1871	In <i>Delphinus</i> ; of the same class as Nos. 50 and 51.
	B and C	..	..	110	2	10, 10		
71	γ Equulei A and C	21 4 1	+9 37	10	25	5, 16	Dec. 2, 1871	Excessively faint. There is a faint triple 1 ^m 57 ^s p. Distances = 3" and 15".
72	Weisse xxi. 511	21 23 1	-5 58	50	2	9, 12	Oct. 7, 1872	Beautiful but very difficult pair, 1 ^m 31 ^s p β <i>Aquarii</i> and 10' 44" north.
73	β <i>Aquarii</i> A and C	21 24 42	-6 8	180	35	3, 16	Aug. 8, 1871	Very faint and difficult; fully one magnitude smaller than Herschel's companion.
74	L. 42052	21 29 12	+20 49	315	1'5	6½, 10	Aug. 12, 1871	Fine and moderately difficult pair in <i>Pegasus</i> .
75	Weisse xxi. 1133 = L. 42736	21 49 10	+10 16	30	1'25	8, 9	Oct. 1, 1872	Fine pair in <i>Pegasus</i> .
76	Weisse xxii 465 = L. 43906	22 22 58	-0 52	335	1'5	8½, 12	Oct. 6, 1872	Elegant pair in a low-power field with ζ <i>Aquarii</i> 44 ^s f, and 11' south.
77	Anonyma A and B	22 27 21	-2 27	210	2	8, 10	Sept. 4, 1872	In the same field with 60 <i>Aquarii</i> , 12' 5 exactly south.
	A and C	..	..	225	20	12		
78	Weisse xxii. 1393 A and B	23 1 40	+30 46	80	10	8, 12	Oct. 19, 1872	In <i>Pegasus</i> ; not difficult.
	A and C	..	..	90	20	14		
79	Weisse xxiii. 187	23 10 54	-2 14	120	1	8, 10	Oct. 25, 1872	A beautiful but very difficult pair in the same field with Σ 2995, 61 ^s f and 4' 6" n. (7 mag. in Weisse.)
80	Weisse xxiii. 229	23 12 12	+4 42	300	1	8½, 9	Sept. 6, 1872	A fine double star, 1 ^m 30 ^s p 7 <i>Picium</i> 1' 39" s.
81	Weisse xxiii. 562	23 28 28	-12 18	20	1'5	8, 12	Oct. 23, 1872	Very difficult; in <i>Aquarius</i> .